Name: _____ Math 10F&LPC H. Date: _____

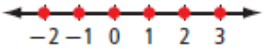
Chapter Ch.5 Relations and Functions

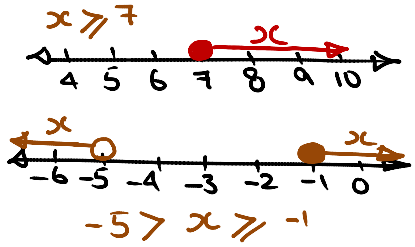
5.2- Properties of Functions

Domain (x) – The set of first elements in a relation – the x values – the independent values
Range (y) – The set of second elements in a relation – the y values – the dependent values.
Function: A special type of relation where each element in the domain (first set) is associated with exactly one element in the range (second set).

The domain and range can be expressed in different ways.

● ≥ more than

Words	All integers equal to or greater than −2 and less than or equal to 3
Number Line	
Interval Notation	[−2, 3]
Set Notation	$\{n \mid -2 \le n \le 3, n \in I\}$
A List	{−2, −1, 0, 1, 2, 3}



Function $x \longrightarrow y$

Not a Function $x \longrightarrow y1$, $x \longrightarrow y2$

Function

x	y
3	7
4	9
5	11
6	13

Not-functi

x	y
3	7
4	9
5	11
3	13

Example 1: For each relation below: Identify its domain and range.
Decide whether the relation is a function.

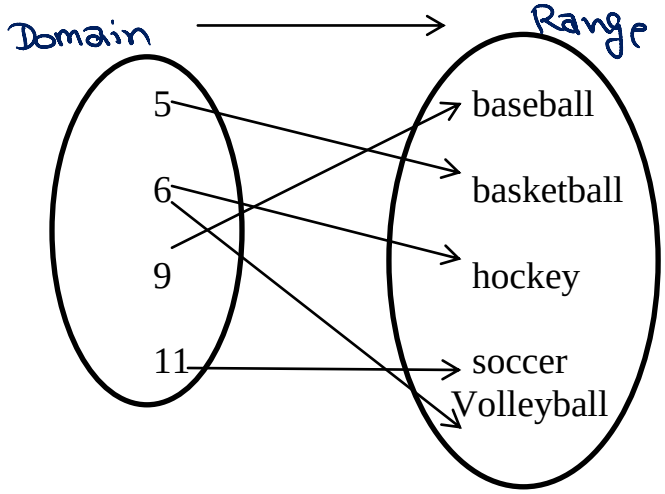
a) A relation that associates 5 foods to the food groups to which they belong;
$\{(orange, fruit), (cheese, dairy), (broccoli, vegetable), (milk, diary), (kiwi, fruit)\}$

Domain: {orange, cheese, broccoli, milk, kiwi}

As List

Range: {fruit, dairy, vegetable, dairy, fruit}

b) Is the number of players on a team for



Not a Function
because the # of playes
6 player → Hockey
→ volleyball

Describing Functions

This table shows the masses of different numbers of Canadian quarters.

In put (x) out-put (y)

Independent Variable Variable → | **Number of Quarters, n** | **Mass, m (g)** | ← ***Dependent***

1	4.4
2	8.4
3	13.2
4	17.6
5	22.0

Domain

4.4, 4.4

Range

$y = 4.4x$

this is a function

The mass of the quarters, *m*, depends on the number of quarters, *n*. So, we say *m*, the mass of the quarters, is the dependent variable and *n*, the number of quarters, is the independent variable.

Function notation

There is a special notation, that is used to represent this situation: if the function name is f, and the input name is x, then the unique corresponding output is called f (x) (which is read as " f of x ".)
We can also use letters: g (x), h (x) or simply y

Ex.; Suppose $f(x) = x + 2$. What is $f(3)$?

$f(3) = 3 + 2 = 5$

$f(x) = 3x + 4$

$f(x) \Rightarrow y$

$y = 3x + 4$

Ex.; Suppose $f(x) = x + 2$. What is $f(x+5)$?

sub. $(x+5) \Rightarrow$ for x

$f(x+5) = x + 5 + 2 = x + 7$

$f(g(x)) = -3(2x-3) + 2 = -6x + 9 + 2 = -6x + 11$

$f(x) = -3x + 2$

$g(x) = 2x - 3$

$f(g(x)) =$

Example 2: ***Find each value if $f(x) = -5x + 2$ and $g(x) = -2x + 3$.***

a. $f(-4)$

$f(x) = -5x + 2$

$f(-4) = -5(-4) + 2 = 22$

b. $f(7)$

$f(7) = -5(7) + 2 = -33$

c. $g(5)$

$g(x) = -2x + 3$

$g(5) = -2(5) + 3 = -7$

d. $g(-7)$

$g(-7) = -2(-7) + 3 = 14 + 3 = 17$

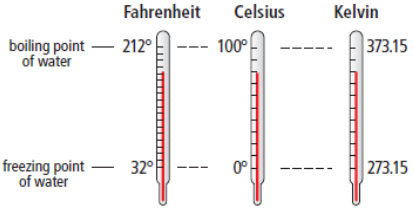
Example 3:

The function F(C) = 1.8C + 32 is used to convert a temperature in degrees Celsius (°C) to a temperature in degrees Fahrenheit (°F).

a) *Determine F(86).*

$f(86) = 1.8(86) + 32 = 186.8\ ^\circ F$

b) *Determine C so that F(C) = 98.6.*



$98.6 = 1.8C + 32$

solve for (C)

$-32 \quad -32$

$\frac{62.6}{1.8} = \frac{1.8C}{1.8}$

$C = 37\ ^\circ C$

Ex:- If $f(x) = -2x + 16$ How much (x) when $f(x) = -48$

$x = 32$

Operations with functions(H)

Given $f(x) = 3x + 2$ and $g(x) = 4 - 5x$, find $(f+g)(x)$, $(f-g)(x)$, $(f \times g)(x)$, and $(f/g)(x)$.

* $(f + g)(x) = f(x) + g(x) = (3x+2) + (4-5x) = -2x + 6$

$(f - g)(x) = f(x) - g(x) = (3x+2) - (4-5x) = 8x - 2$

$(f \cdot g)(x) = f(x) \cdot g(x) = (3x+2)(4-5x) = -15x^2 + 2x + 8$ Foil

$(f/g)(x) = \frac{f(x)}{g(x)} = \frac{3x+2}{4-5x}$

Find $f(g(x)) = f(4-5x)$ sub $(4-5x)$ For $x \cdot f(x)$

$f(g(x)) = 3(4-5x) + 2$

$= 12 - 15x + 2 = -15x + 14$

Using function notation to find values

We can write an equation that represents a function using function notation.

Example 4: Carmen works for a research company in a shopping mall. The equation ***P = 5n + 30*** represents her daily pay, P dollars, when she conducts n surveys. $P(n) = 5n + 30$

* a) Describe the function. Write the equation using function notation.

$P(n) = 5n + 30$

b) Find the value of ***P(8).*** What does this number represent? Note: *P(8)* is the value of P when **n=8.**

$P(8) = 5(8) + 30 = 70$

c) Find the value of n when P(n) = 90. What does this number represent?

$90 = 5n + 30$ Solve For(n) $5n = 60$ $n = 12$

Example 4: Which set of ordered pairs does not represent a function?

a. $\{(2,5),(3,8),(4,11),(2,-1)\}$

b. $\{(4,6),(5,-7),(7,9),(8,-10)\}$

c. $\{(-3,-8),(-1,-6),(-2,5),(0,7)\}$

d. $\{(7,0),(4,-1),(-6,5),(-8,0)\}$

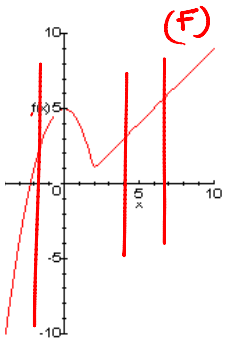
Vertical Line Test

- A test to see if a graph represents a function

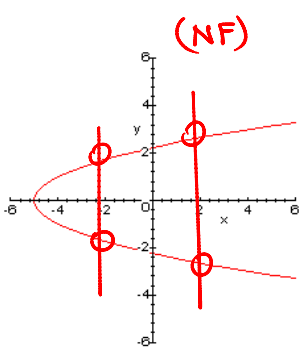
if any vertical line intersects the graph at more than one point, the relation is not a function

Example 5: Which of these graphs represents a function? Justify the answer.

(F)



(NF)



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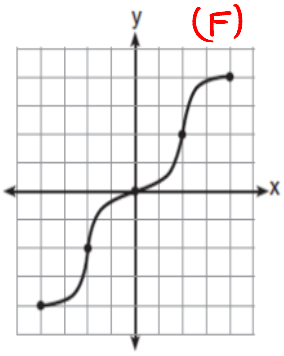
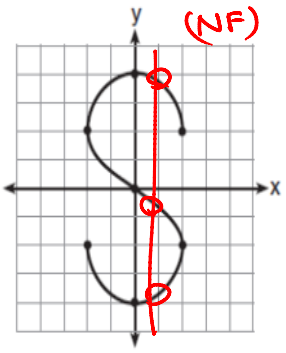


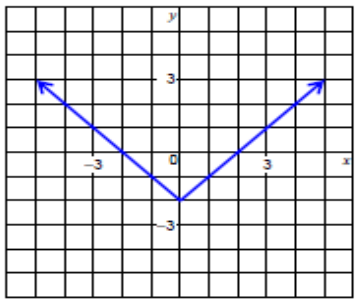
(NF)



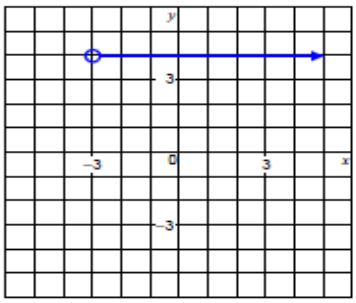
○→ use ( )
●→ use [ )

***Example 6*:** Determine the domain and the range of each graph

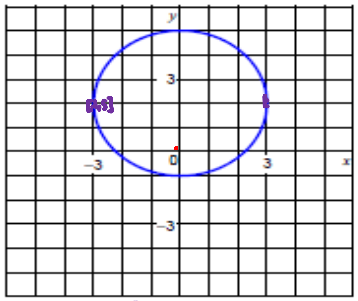
a)



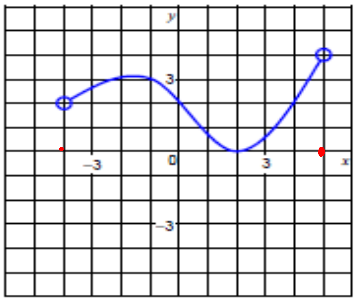
b)



c)

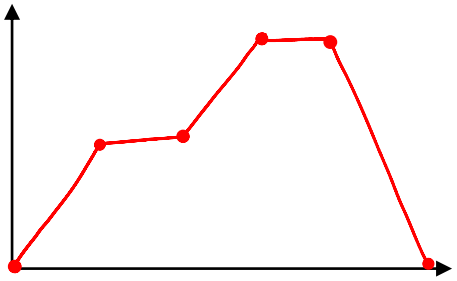


d)

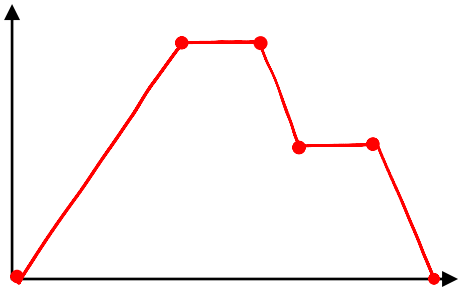


Draw a graph to illustrate the following:

***Height Vs Time*:**
A person walks up a hill
They stop at a view point
They continue up the hill to the top.
They come back down



***Distance Vs Time*:**
A person walks to visit her friend.
They stay to chat.
On the way home they stop to visit a second friend.
They stay to chat They come back home.



Assignment: *p. 270 Q #4, 5, 8, 9, 12–15, 18, 19*